

102 Determine target asset allocation (e.g., 40% domestic stock, 10% foreign stock, and 50% bonds) based on scoring of an investor profile questionnaire

104 Receive list of investment options offered by a particular plan

106 Compute risk adjusted excess return of funds relative to a benchmark (e.g., the Wilshire 5000)

108 Select a subset of investment options from the received list of investment options for further analysis

110 Construct a portfolio from the subset of funds using the risk-adjusted excess return for each fund based on the determined target asset allocation as a constraint

114 relax target asset allocation constraints

112 Are characteristics of portfolio satisfactory?

FIG. 1

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100 ~

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Target Asset Mixes

Target Asset Mix	Conservative	Balanced	Growth	Aggressive Growth
Stocks-Domestic	20%	45%	60%	70%
Stocks-Foreign	0%	5%	10%	15%
Bonds	50%	40%	25%	15%
Short-term	30%	10%	5%	0%

103a

103b

103c

103d

101a

101b

101c

101d

FIG. 2

Your "investor profile" is a picture of a hypothetical investor who has similar characteristics to yours. Your response to this questionnaire will be evaluated to determine your risk tolerance, personal financial situation and time horizon for investing for retirement. Your target asset mix will be based on the answers to these profile questions.

105a ~ 1.) Enter Total Investable Assets:

Please list amount of money you have saved for retirement and other, non-retirement goals. This information will help us assess your household's entire financial situation. Include your transfer or rollover amount under Retirement in the Short-term category because in this process we assume that your transfer or rollover is a cash position.

	Retirement	Non-retirement
Stocks	\$	\$
Bonds	\$	\$
Short-term	\$	\$
Other	\$	\$
Total	\$	\$

**Retirement:** Assets designated for retirement including your rollover or TOA amount.

**Non-retirement:** Assets designated for other goals.

105b ~ 2. What is the chance your household will need to spend more than \_\_\_% of your savings for another purpose in the next 5 years? (Your answer helps us determine whether a significant amount of savings will be needed soon.)

\_\_\_75% \_\_\_50% \_\_\_25% \_\_\_10% or less

105c ~ 3. How much household income are you saving on an annual basis toward your goal? (What is your annual contribution to this goal?)

105d ~ 4. How many people do you support other than yourself? (Dependents may include children, elderly parents, and your spouse.)

105e ~ 5. How much is your household income before taxes? (Include salary, bonus, commissions and other sources of income such as a rental property, alimony and child support.)

<u>  </u> \$21,000	<u>  </u> \$21,000 to \$30,000	<u>  </u> \$31,000 to \$70,000	<u>  </u> \$71,000 to \$100,000	<u>  </u> \$101.00 0 to \$150,000	<u>  </u> \$151.00 0 to \$250,000	<u>  </u> \$251.00 0 or more
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- 105f ~ 2. Please indicate how your household income might change over the next five years.  
(If your household income fluctuates widely from year to year, answer in terms of average increased in your household income over time.)

   Far outpace  
   Mildly outpace  
   Keep pace  
   Decrease

- 105g ~ 3. How much of your monthly take-home income is used to pay for essential expenses?  
(Include rent or mortgages, food, utilities, recreation, etc.).

   Under 25%  
   25 to 50%  
   50 to 75%  
   Over 75%

- 105h ~ 4. What is your estimated combined federal, state and local tax bracket? (Keep in mind that once you leave the workforce; your tax bracket is likely to be lower, although tax rates could change by then.)

   15%  
   28%  
   36%  
   39.6%

- 105i ~ 5. How would you describe your household's overall financial situation? (Consider your employment outlook, benefits, expenses and savings.)

   Very secure and stable  
   Secure and stable  
   Somewhat secure and stable  
   Neither secure nor stable

- 105j ~ 6. Which of the following best describes your level of investment knowledge and experience with stocks or stock mutual funds? (Your answer will help us to determine the depth of your investment experience.)

   Novice investor  
   A few years experience. basic understanding

- ☐ A few years experience, solid understanding
- ☐ Several years experience, basic understanding
- ☐ Several years experience, solid understanding
- ☐ Experienced, owned options and commodities

105K ~ 7. Keeping in mind your tolerance for short-term fluctuations, as well as investment goals, where would you be most comfortable placing yourself on this scale?

Low end: Avoiding short-term losses is more important than higher total returns.

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7   ☐ 8   ☐ 9   ☐ 10

High end: Higher total return is more important than avoiding short-term losses.

105L ~ 8. Assuming that you invested \$100,000 and the market dropped in the first years, causing the value to fall, where would you sell? (Your answer will help us understand your comfort with investment risk.)

- ☐ When the value drops 5% to \$95,000.
- ☐ When the value drops 10% to \$90,000.
- ☐ When the value drops 15% to \$85,000.
- ☐ When the value drops 20% to \$80,000.
- ☐ When the value drops more than 20%.
- ☐ I would not sell.

If you are within two years of your retirement goal, please answer questions 13 and 14. Otherwise, you do not need to answer these questions.

105M ~ 13.) Estimate the annual income you will need from your retirement investments.

105N ~ 14.) Choose the statement that best describes your plan to use your retirement savings and investments. (The items in the drop down include:

- a) intend to take MRD by IRS
- b) use other sources first
- c) withdraw regularly
- d) use most of money early
- e) withdraw more than half

### Multi-factor regression model

$$R_t = \alpha + \beta_1 R_{1t} + \beta_2 R_{2t} + \dots + \beta_N R_{Nt} + \epsilon_t,$$

where

$\alpha$  = the risk adjusted excess return (alpha) ;

$R_t$  = the excess return of a fund in month  $t$  ;

$R_{kt}$  = the excess return of factor  $k$  in month  $t$  ( $k = 1 \dots N$ ) ;

$\beta_k$  = the beta of factor  $k$  ( $k = 1 \dots N$ ) ;

$\epsilon_t$  = the tracking error in month  $t$  ;

$p$  - value =  $t$  - distribution (student  $t, n - p - 1$ )

$$\text{student } t = \frac{\alpha}{\sigma(\epsilon_t)/\sqrt{n-p}} = \text{Information ratio} \times \sqrt{n-p}$$

$$\text{Information ratio} = \alpha/\sigma(\epsilon_t)$$

where

$\alpha$  = average risk adjusted excess return during the period;

$\sigma(\epsilon_t)$  = tracking - error wrt the custom benchmark;

$n$  = number of observations;

$p$  = number of the independent random variables;

$n - p - 1$  = degrees of freedom in  $t$  - test ;

$$\text{Minimize } \lambda W^T H W - G^T W$$

$$\text{Subject To } \sum_{i=1}^N w_i = 1$$

$$\text{Upper}_{\text{stock}} \geq \text{Stock\%} \geq \text{Lower}_{\text{stock}}$$

$$\text{Upper}_{\text{bonds}} \geq \text{Bonds\%} \geq \text{Lower}_{\text{bonds}}$$

$$\text{Upper}_{\text{cash}} \geq \text{Cash\%} \geq \text{Lower}_{\text{cash}}$$

$$\text{Upper}_{\text{foreign}} \geq \text{Foreign\%} \geq \text{Lower}_{\text{foreign}}$$

where

$W$  = weight vector of funds =  $[w_1 \ w_2 \ \dots \ w_N]$

$H$  = covariance matrix of fund tracking - error wrt the investment benchmark

$G$  =  $p$  - value of funds

$\lambda$  = risk aversion ratio (e.g., an empirical value of 10,000)

FIG. 4

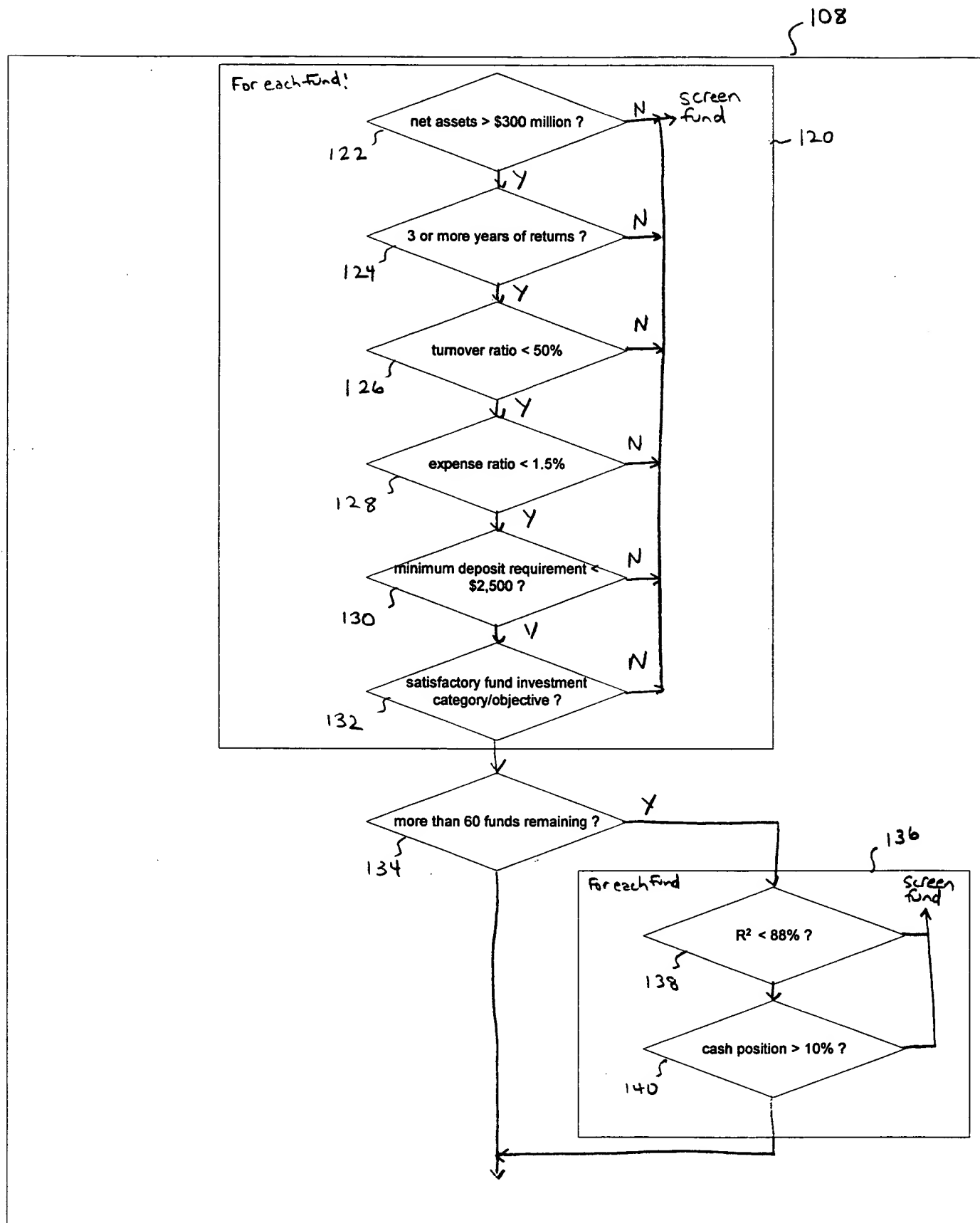


FIG. 5

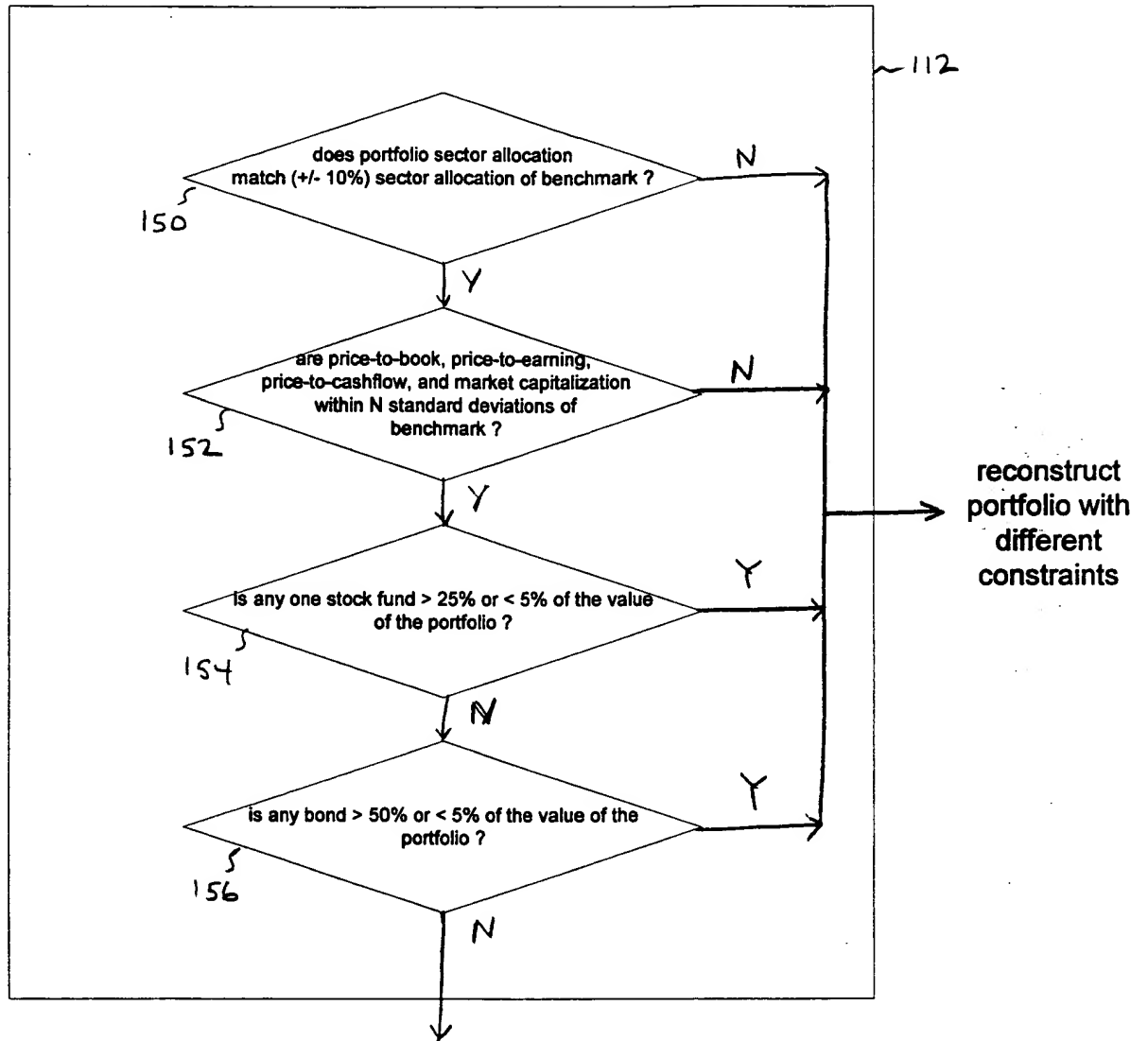


FIG. 6



For each 10% increment of investment of company stock, construct a portfolio by:

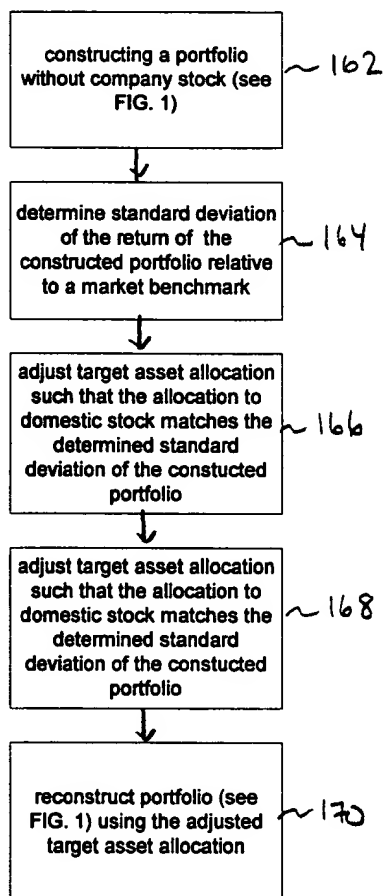


FIG. 7